

WHAT IS CLAIMED IS

1. A suspension for a vehicle comprising:

a wheel-in motor which is equipped with a motor provided in a wheel and an output shaft of the motor rotating with the wheel, and

5 an arm for suspending a car body, wherein

one end of the arm is fixed to the car body with a pivot to perform a swing motion in the longitudinal direction of the car body, another end of the arm is connected to the output shaft of the motor so as to rotate relatively to the output shaft.

10 2. The suspension according to Claim 1,

further comprising a swing control mechanism for controlling the swing motion of the arm during traveling of the car.

15 3. The suspension according to Claim 1,

further comprising a spring and a damper for absorbing vibration transmitted to the car body via the wheel-in motor and the arm, wherein the damper has a function for controlling the swing motion of the arm.

20 4. The suspension according to Claim 1, wherein

a damper and a spring for a shock absorber is provided at the pivot of the arm;

the spring is a coil spring, which is arranged

25 around the pivot so as to be twisted against the swing

motion of the arm.

5. The suspension according to Claim 1, wherein  
a damper and a spring for a shock absorber is  
provided at the pivot of the arm;

5       the spring is a coil spring, which is arranged  
around the pivot so as to be twisted against the swing  
motion of the arm; and

a load of the spring is applied adjustably  
beforehand with a spring load adjusting mechanism.

10      6. The suspension according to Claim 1, wherein a  
damper and a spring for a shock absorber is provided  
between the arm and the car body.

7. The suspension according to Claim 1, wherein  
the wheel has a built-in brake unit driven by an  
15     electric signal.

8. The suspension according to Claim 1, further  
comprising a wheel speed sensor for detecting a wheel  
speed, an arm angle sensor for detecting an angle of  
the arm, a torque sensor for detecting torque of the  
20     motor, and a body angle sensor for detecting a tilt of  
the car body.

9. A vehicle control method comprising:  
using each suspension having the arm and the  
wheel-in motor in any one of Claims 1 to 8 as an  
25     independent suspension system of a car body;

controlling a posture of the car body during traveling of the car by at least controlling a revolution speed and a torque of each wheel-in motor of front wheels and rear wheels, and controlling the 5 swing motions of the arm of each suspension of front wheels and rear wheels in the longitudinal direction of the car body.

10. The vehicle control method according to Claim 9, wherein a posture of the car body is controlled during traveling of the car by controlling a response 10 of the swing motion of each arm according to a state of a road surface, and by controlling an angle of the arm by controlling the revolution speed and the torque of each wheel-in motor.

15. The vehicle control method according to Claim 9, wherein during traveling of the car, (1) when the height on the front side of the car body is to be lowered, the revolution speed and the torque of the wheel-in motors on the front wheel side are made 20 larger than those of the wheel-in motors on the rear wheel side, and (2) when the height on the rear side is to be lowered, the revolution speed and the torque of the wheel-in motors on the rear wheel side are made smaller than those of the wheel-in motors on the front 25 wheel side, and (3) when the car height on the front

side is to be increased, the revolution speed and the torque of the wheel-in motors on the front wheel side are made smaller than those of the wheel-in motors on the rear wheel side, and (4) when the height on the 5 rear side is to be increased, the revolution speed and the torque of the wheel-in motors on the rear wheel side are made larger than those of the wheel-in motors on the front wheel side.

12. The vehicle control method according to Claim  
10 9, wherein during traveling of the car, (1) when the height of either of the left and right sides of the car body is to be lowered, the revolution speed and the torque of the front wheel-in motor on the side of the height to be lowered are made larger than the 15 revolution speed and the torque of the front wheel-in motor on the side of the height not to be lowered, and the revolution speed and the torque of the rear wheel-in motor on the side of the height to be lowered are made smaller than the revolution speed and the torque 20 of the rear wheel-in motor on the side of the height not to be lowered, and

25 (2) when the height of either of the left and right sides of the car body is to be increased, the revolution speed and the torque of the front wheel-in motor on the side of the height to be increased are

made smaller than the revolution speed and the torque  
of the front wheel-in motor on the side of the height  
not to be increased, and the revolution speed and the  
torque of the rear wheel-in motor on the side of the  
height to be increased are made larger than the  
revolution speed and the torque of the rear wheel-in  
motor on the side of the height not to be increased.

5           13. A vehicle control apparatus comprising:  
              a wheel-in motors which is provided in each wheel  
10          of front and rear wheels and has an output shaft  
              rotating with the wheels;

10          an arm of each one of front and rear suspensions  
              for suspending a car body, wherein one end of the arm  
              is fixed to the car body with a pivot to perform a  
15          swing motion in the longitudinal direction of the car  
              body, another end of the arm is connected to the  
              output shaft of the motor so as to rotate relatively  
              to the output shaft; and

20          an arm angle control unit for controlling a  
              revolution speed and a torque of each wheel-in motor  
              to control an angle of the arm..

25          14. The vehicle control apparatus according to  
              Claim 13, further comprising a control mechanism for  
              controlling a response of the swing motion of the arm,  
              and when controlling an angle of the arm, the

response of the swing motion are controlled to be more rapid than usual traveling.

15. 1. A suspension for a vehicle comprising:  
a wheel-in motor which is equipped with a motor  
5 provided in a wheel and an output shaft of the motor  
rotating with the wheel, and  
an arm for suspending a car body, wherein  
one end of the arm is fixed to the car body with a  
pivot to perform a swing motion in the longitudinal  
10 direction of the car body, another end of the arm is  
connected to the output shaft of the motor with at a  
bearing mechanism.